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(71)出願人　391018639
パブ日立エンジニアリングサービス株式会社
神奈川県横浜市磯子区磯子１丁目２番10号

(72)発明者　加藤　登男
神奈川県横浜市磯子区磯子１丁目２番10号　パブ日立エンジニアリングサービス株式会社内

(72)発明者　新井　康市
神奈川県横浜市磯子区磯子１丁目２番10号　パブ日立エンジニアリングサービス株式会社内

(74)代理人　弁理士　岡田　梧郎

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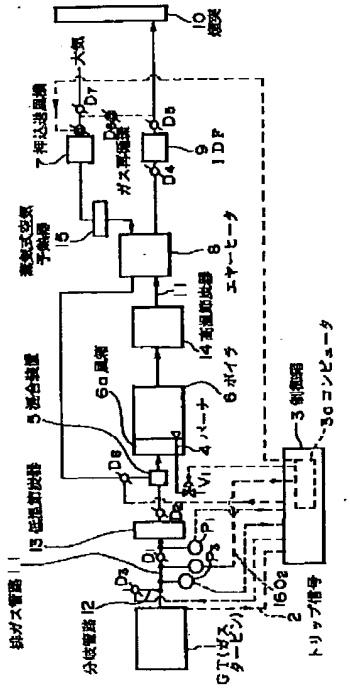
(54)【発明の名称】　発電用ガスタービン排気再燃ボイラの自動運転方法

(57)【要約】

【目的】　発電用ガスタービンの排ガスを再燃するボイラで、そのガスタービンのトリツプ時に、排ガス管路のダンパを制御し、排ガスの無駄な放出を避け急速かつ安全容易にＧＴ（発電用ガスタービン）排気再燃から大気燃焼へと切り替えし、蒸気条件の低下、発電出力の低下を直ちにボイラでバツクアツプする自動運転方法の提案。

【構成】　排ガス管路１１のダンパD_1 の上流の風圧P_3 と下流の風圧P_1 を検知し、前記風圧P_3 が常時P_1 より高くする自動制御をし、ＧＴトリツプ時においても、あるいはボイラへの排ガスの導入切り離し操作においても、安全容易な運転ができる発電用ガスタービン排気再燃ボイラの自動運転方法である。



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【特許請求の範囲】

【請求項1】　発電用ガスタービン排ガス出口、ダンパD_3 付き分岐管路の分岐部、ダンパD_1 、排ガスと空気の混合装置、蒸気発電用ボイラの風箱とを排ガス管路で接続し、ダンパD_1 の上流の風圧P_3 と下流の風圧P_1 とを検知し、前記風圧P_3 をほぼ定常に保持するようにダンパD_3 を制御し、前記蒸気発電用ボイラをバツクアツプボイラとして使用するための排ガスの導入、安全容易な切り離し操作をすることを特徴とする発電用ガスタービン排気再燃ボイラの自動運転方法。

【請求項2】　発電用ガスタービンのトリツプ時に、暫時風圧P_3 を定常値に保持し、ついで風圧P_3 と風圧P_1 との差が規定する値になつたとき、ダンパD_1 を全閉とし、ダンパD_3 は常にP_3 がP_1 より大でガス逆流することのない開制御をして排ガスを放出し、ガスタービン発電を蒸気発電用ボイラで即時かつ急速にバツクアツプすることを特徴とする請求項1の発電用ガスタービン排気再燃ボイラの自動運転方法。

【請求項3】　ダンパD_3 付の分岐管路には、該ダンパの大気放出側にオリフィスを設け、排ガス放出時の消音と同時にダンパD_3 の制御性を向上させることを特徴とする請求項1または2に記載の発電用ガスタービン排気再燃ボイラの自動運転方法。

【請求項4】　排ガスと空気の混合を、排ガス管路に接続する空気管路に設けるダンパのダンパブレードに複数の空気通過用小孔を設け混合機能を高めたことを特徴とする請求項1または2に記載の発電用ガスタービン排気再燃ボイラの自動運転方法。

【請求項5】　マイクロコンピュータにガスタービン出力、排ガス温度、気温、ボイラ負荷の信号をインプツトし、ボイラ風箱で必要とするO_2 量を計算し供給空気量を決定し、押込送風機のベーン開度を指示し風量調節することを特徴とする請求項1ないし4のいずれかに記載の発電用ガスタービン排気再燃ボイラの自動運転方法。

【請求項6】　前記ダンパD_1 を手動で徐開、徐閉操作をし、大気放出用のダンパD_3 は下流の風圧P_1 より高い値P_3 に自動制御することを特徴とする請求項1ないし5のいずれかに記載の発電用ガスタービン排気再燃ボイラの自動運転方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は蒸気発電用ボイラに発電用ガスタービン排ガス管路を接続し、ガスタービンの排気を導入しボイラの燃焼に利用し、ボイラのパワーアツプを図る排気再燃システムにおいて、ガスタービン排気をボイラに導入、あるいは導入を切り離して各単独運転をする場合の自動運転およびガスタービンのトリツプ時に蒸気条件と発電力を低下させないで短時間に蒸気及び必要電力を回復し得るようにする発電用ガスタービン排気再燃ボイラの自動運転方法に関する。

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【0002】

【従来の技術】発電用ガスタービン（以下ＧＴと略称する）がトリツプしたときは、ボイラタービン発電（ＢＴＧと略称する）により直ちに電力のバックアツプすることが好ましいが、計装、設備が複雑になり経済的な面からも、小型発電プラントでは一旦ボイラを停止させ、その後に押込送風機（ＦＤＦと略称する）を廻して再起動する方法がとられている。またボイラのバーナ燃焼を停止せずに継続して運転する場合でも、一般的には切り替えによるドラフトハンチングが少なくなり、ボイラ運転が安定してから燃料を増加してゆくのが通常であり、ＧＴトリツプ後１０分位は入熱減少による影響で過熱器出口蒸気圧力（ＳＯＰ）、蒸発量、過熱器出口蒸気温度（ＳＯＴ）が下降し、蒸気タービンの出力も低下し、プロセスへ悪影響を及ぼすこととなる。

【0003】一方ＧＴ排ガスをボイラに導入する場合、及びその逆に導入中のものを切り離して大気へバイパスさせる場合も、その操作はＧＴ、ボイラとも運転を継続させる必要があるため、極めて慎重を要するもので、ダンパ操作のタイミング、及び目標とする風圧の取り方によつてはＧＴ背圧高による異常発生、ボイラ燃焼用空気の逆流によるバーナの消火、逆火等大きなトラブルとなることが考えられる。

【0004】

【発明が解決しようとする課題】発電用ガスタービンと発電用ボイラの組み合わせにおいて、ＧＴ排ガス出口の圧力を制御しＧＴの通常運転においてボイラの運転を安定させ、ＧＴがトリツプしたとき、速やかに蒸気タービン発電を必要レベルまで回復させ、バツクアツプを迅速有効にする方法、並びにＧＴガス導入、切り離しの操作が安全かつスムースに行われる発電用ガスタービン排気再燃ボイラの自動運転方法を提供するにある。

【0005】

【課題を解決するための手段】この発明は、発電用ガスタービン排ガス出口、ダンパD_3 付き分岐管路の分岐部、ダンパD_1 、排ガスと空気の混合装置、蒸気発電用ボイラの風箱とを一連に排ガス管路で接続し、ダンパD_1 の上流の風圧P_3 と下流の風圧P_1 とを検知し、前記風圧P_3 をほぼ定常に保持するようにダンパD_3 を制御し、前記蒸気発電用ボイラをバツクアツプボイラとして使用するための排ガスの導入、切り離し操作を安全容易に行わせることを特徴とする発電用ガスタービン排気再燃ボイラの自動運転方法である。

【0006】またＧＴのトリツプ時に、暫時風圧P_3 を定常値に保持し、ついで風圧P_3 と風圧P_1 の差が規定する値になつたとき、ダンパD_1 を全閉とし、D_3 は常にP_3 がP_1 より大でガスが逆流することを防止する制御をして排ガスを放出し、ガスタービン発電を蒸気発電用ボイラでバツクアツプすることを特徴とする発電用ガスタービン排気再燃ボイラの自動運転方法である。

【0007】

【実施例1】図1は本願発明の実施に使用する装置と管系統の図面である。発電用ガスタービン排ガス管路11のガスタービン出口部に大気放出排ガス量制御と消音の手段をもつ分岐管路12を設け、その後流で蒸気発電用ボイラ6の風箱6aの入口には排ガスと空気の混合装置5を設け、GT排ガスの導入切り離し運転においてはダンパD_1の上流の風圧P_3を常に下流の風圧P_1より高く保持するようにダンパD_3を制御しGT排ガス導入切り離し運転時D_1、D_3ダンパの操作タイミング遅れによるGT背圧異常高でP_1がP_3より高くなるためのボイラ側からの燃焼用空気の逆流、バーナ消火、逆火等なしに安全運転ができるものである。

【0008】発電用ガスタービン1のトリツプ時には、トリツプ信号2は制御箱3に送られる。GTがトリツプした直後はD_1は通常全開であり、D_3は全閉である。前記トリツプ信号により、D_1は直ちに閉方向に動作し、GT排ガス量の急激な低下による風圧P_3の減少を防ぐ。この間基本的にはD_3は全閉のままである。もしD_3を直ちに開とすると分岐管路の排ガス管路11の接続部の排ガス圧力P_3が、D_1の後流の排ガス圧力P_1よりも低いこととなりボイラ側から分岐管12に向かつて燃焼用空気が逆流し、バーナの消火、逆火の恐れ、あるいは少なくともボイラの運転制御を乱すこととなる。（ダンパD_1部のガス流れ抵抗による圧力降下は考慮する必要がある。）

【0009】このため順次D_1を閉方向にするとともに、P_1よりある値だけ高くセットされたP_3値を維持するよう例えばセツト値よりP_3が高くなれば、D_3は自動開となり、一時的なGT背圧高を防止する。但し前記の如くP_3は常にP_1より高く制御し逆流を防止する。D_1全閉後はD_3のドラフト制御は解除され全開へと動き、トリツプ後GT排ガス路の確保と再起動に備える。

【0010】一方GTトリツプにより排ガスによる入熱減少、燃焼用空気不足を生ずるので、これに対応して自動的に入熱増、空気増となり、かつボイラにハンチング運転を生じさせることもなく、GTトリツプによるボイラの変動も最小に抑えることができる。

【0011】なお図1により、GT排ガス流れに沿い位置する機器、空気流れに沿う機器について述べる。ガスタービンを出た排ガスはダンパD_1、低温節炭器13、ダンパD_2、混合装置5、風箱6a，ボイラ6の火炉、高温節炭器14、エアヒータ8、ダンパD_4、誘引送風機9、ダンパD_5を経由して煙突10より排出される。ボイラの燃焼用空気については大気よりダンパD_7、押込送風機7、蒸気式空気予熱器15、エアヒータ8、ダンパD_8を経由して混合装置5に送られる。この空気は混合装置15内でGTからの排ガスと混合し風箱6aに送られバーナ4からの燃料を燃焼するのに使用される。

D_6は押込送風機に排ガスを再循環する管路に設けられたダンパで、低NOx燃焼に使用される。

【0012】このような構成にすると、GT1が定常の負荷運転をしているとき、ガスタービンの排ガスは一例では約500℃の高温で相当の顕熱と約15．5％（vol％）の酸素（O_2）を持ちこれを有効に燃焼に使用しすることは、従来GTのリパワリングシステムとして知られている。これに対し本願発明は、前記のごとくGTガスの導入、切り離し時に、安全かつ容易な運転が可能でありまた自動的に各ダンパの操作を行い、GTトリツプによるボイラの変動を最小にし短時間に大気燃焼へと切り替えるGT大気再燃焼ボイラの自動運転を可能とするものである。

【0013】図5はGTトリツプ時の各ダンパの動作ブロツク図である。

【0014】

【実施例2】図2は本願発明の実施に使用する排ガス空気混合装置の一例を示すものである。排ガスダクトと空気ダクトと接続部に近く設けたダンパ17のダンパプレードに複数の小孔18を設けた場合である。ダンパ17は通常のダンパ機能を有し、全閉でも最小量の空気を供給できる。

【0015】これによりGT排ガス再燃時は少ない空気量を多量の排ガス中に噴射混合が可能であり、GT排ガスを切り離してボイラの単独燃焼時は、ダンパD_7を開にし多量の空気を流すことができる。一枚のダンパで場所も取らず排気燃焼と大気燃焼に対応できる。

【0016】

【実施例3】空気混合装置として図3に示すように、複数の小穴付きの空気供給管20の一以上を排ガス流路を横断して設け、さらにその下流に空気供給分岐管21を設け、分岐管21から供給する空気量を制御するダンパ22を設けると効率よい空気排ガス混合ができるが、ダクトが複雑になり費用のかかるという問題がある。また排ガス流れと空気流れの交差する場所の下流に複数枚の金網を並列に配置した混合部を設けたものでも良い。

【0017】

【実施例4】図4は分岐管路12の縦断面図である。ここに設けたダンパD_3は、定常の運転では排ガスを全量ボイラへ流すため全閉である。しかし排ガスをボイラに導入する時及び逆に切り離し時には圧力P_3を定常P_1より高い値にするよう制御箱3からの信号で制御される。GTトリツプ時には、トリツプ信号2を受けた制御箱3からの信号で圧力P_3は暫時一定に保持される。この時D_3は閉であるが、ボイラ側へのダンパD_1が急速に閉となるのでGT排ガスの風圧が異常高とならず、またボイラ運転を阻害するボイラ側からの逆流ガスの流入のないようにD_3ダンパは制御される。次いでダンパD_1は全閉とこの時点でドラフト制御は解除されて、ダンパD_3は自動的に順次開として行く。

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【００１８】このダンパD_3の後流で分岐管内に一以上の抵抗オリフィス１９ａを持つ板１９を一以上を並列配置するときは、この部が消音器として機能するものである。ダンパD_3の後流に抵抗オリフィス付きの板１９があるので、排ガス放出に際しての抵抗ともなり、これでダンパD_3の制御性を向上させる。またその消音機能によりサイレンサを不要にできる。ダンパD_3の動作はダンパD_1の動作と対応するものであり、ダンパD_1の後流にはボイラ設備があるので抵抗があることになる。一方ダンパD_3の後流には通常オリフィスがないので抵抗がなく、僅かの開度でも多量のガスが流れる、つまり制御性が悪い。本願発明はこれを解決せんとするものである。

【００１９】

【実施例５】ガスタービンの出力信号、大気温度の信号、ボイラ負荷の信号、排ガスのO_2信号を制御箱３は受け、その内蔵するコンピュータ３ａで風箱６ａの必要とするO_2量を計算し押込送風機７のベーン開度を制御し、これにより適当な空気量を風箱に送り込むことができる。

【００２０】通常風箱６ａ内のO_2を計測し、これを一定値にすべく空気量をきめているが、これでは風箱内のO_2の「ばらつき」計測の遅れ、及びボイラの負荷大なる時の空気量の増大への対応ができない。

【００２１】

【実施例６】本願発明にかかる、排気再燃ボイラの運転に際しては、大気燃焼から排気燃焼への切り替え及びその逆の場合において、ダンパD_1を手動操作で徐開、徐閉とし、大気放出ダンパD_3は下の風圧P_1より高いP_3にし自動制御し、安定した運転がされる。

【００２２】

【実施例７】なおＦＤＦ（押し込み送風機）７の大気吸入側ダクトには吸入大気の量を制御するD_7が設けられている。排気再燃時ＧＴトリツプすると直ちに空気量を増加させ、大気燃焼としなければならない。この時D_7が短時間で全開することにより、別途サクションベーンの開動作と合わせて対応できる。このD_7ダンパと、ダクトのＦＤＦとの接続部との間にサクションベーン型などの自動制御ベーンを設け図５のブロツク図に示すような制御ができる。

【００２３】

【実施例８】発電用ガスタービンのトリツプ時の追随をボイラにつき観察したことを下記する。ガスタービン負荷１０００ＫＷ、ボイラ負荷３０ｔ／ｈの状態でガスタービンをトリツプさせ、ボイラが安全に運転できることを確認した。

①燃焼用空気は再燃焼状態から予め制御装置にインプットした大気燃焼空気状態に増量上昇し、約４５秒間その状態維持し、その後通常の自動制御運転に入った。

②空気の供給量が増加後、それに対応し燃料のバーナへの供給量は増加し約４５秒その状態を保持した後通常の自動運転になつた。

③燃焼は安定しており特に問題となる状態はなかつた。

④節炭器入口ダンパD_1、大気放出ダンパD_3はそれぞれ計画したように動作し、ガスタービン出口圧力が必要以上に上昇することはなかつた。

⑤ボイラの主蒸気圧力、主蒸気温度、蒸発量はほとんど変化しないことが確認できた。

【００２４】

【発明の効果】この発明を実施することにより以下の効果が得られる。

（１）ＧＴ排ガスの導入、切り離し運転時風圧P_3は常にP_1より高く保持されるので、ボイラの燃焼用空気の逆流がなく、まＴＧＴ排ガス圧が異常に高くなることもなく安全かつ容易に排ガス導入、あるいは切り離し操作ができる。

（２）ＧＴトリツプ時のボイラ諸元の復帰につき下記する。一例では定格ボイラ蒸発量４２Ｔ／Ｈ、ＳＯＴ（過熱器出口温度）４７０℃、ＳＯＰ（過熱器出口圧力）８３ａｔｇ、蒸気タービン発電用ボイラとＧＴの組み合わせでＧＴトリプしたのち、

①従来法では５分後３３Ｔ／Ｈに下がつたものが、本願発明ではトリツプ後直ちに供給燃料量を増加できるので、蒸発量の低下は認められない。

②従来法ではＳＯＴは４５５℃になつたものが、本願方法ではＳＯＴは変化しなかつた。

③従来法ではＳＯＰは７９ａｔｇになるが、本願発明では圧力低下は認められなかつた。

（３）ＧＴトリツプによるボイラへの影響を、本願方法では直ちにバツクアツプできるのでプラントへの悪影響は完全に除去された。

【００２５】

【図面の簡単な説明】

【図１】図１は本願発明の実施に使用する装置の配置と管系統の図面である。

【図２】図２は排ガスとと空気を混合する装置の斜視図である。

【図３】図３は他の排ガスと空気の混合装置の模式断面図である。

【図４】図４は分岐管路１２の縦断面図である。

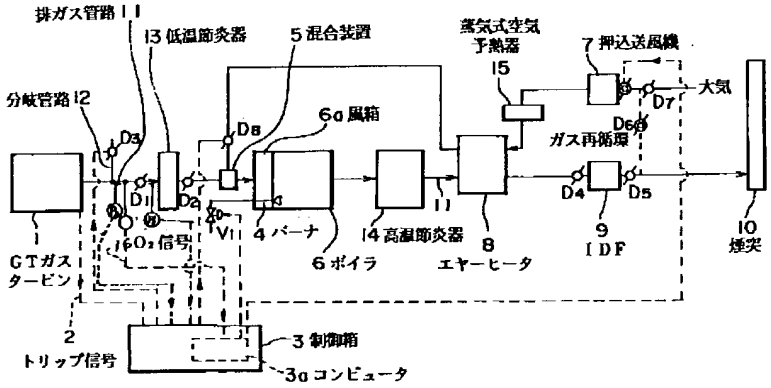
【図５】図５はＧＴトリツプ時の各ダンパ動作のブロック図である。

１	ＧＴ（発電用ガスタービン）
２	トリツプ信号
３	制御箱
３ａ	コンピュータ
４	バーナ
５	混合装置
６	ボイラ
６ａ	風箱

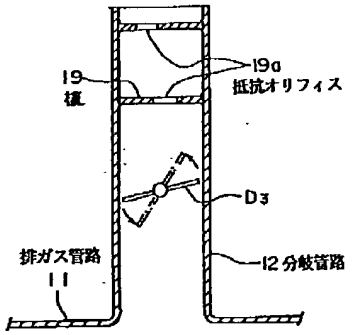
7	
7	FDF（押込送風機）
8	エヤヒータ
9	IDF（誘引送風機）
10	煙突
11	排ガス管路
12	分岐管路
13	低温節炭器
14	高温節炭器
15	蒸気式空気予熱器

8	
16	O_2 信号
17	ダンパ
18	小孔
19	板
19a	抵抗オリフィス
20	空気供給管
21	空気供給分岐管
22	ダンパ

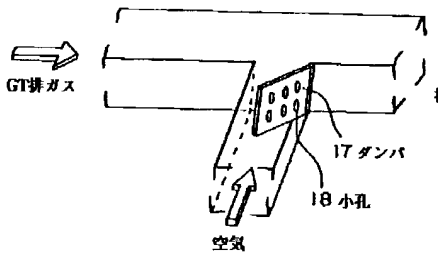
【図1】



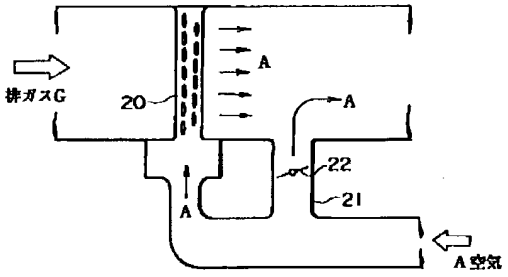
【図4】



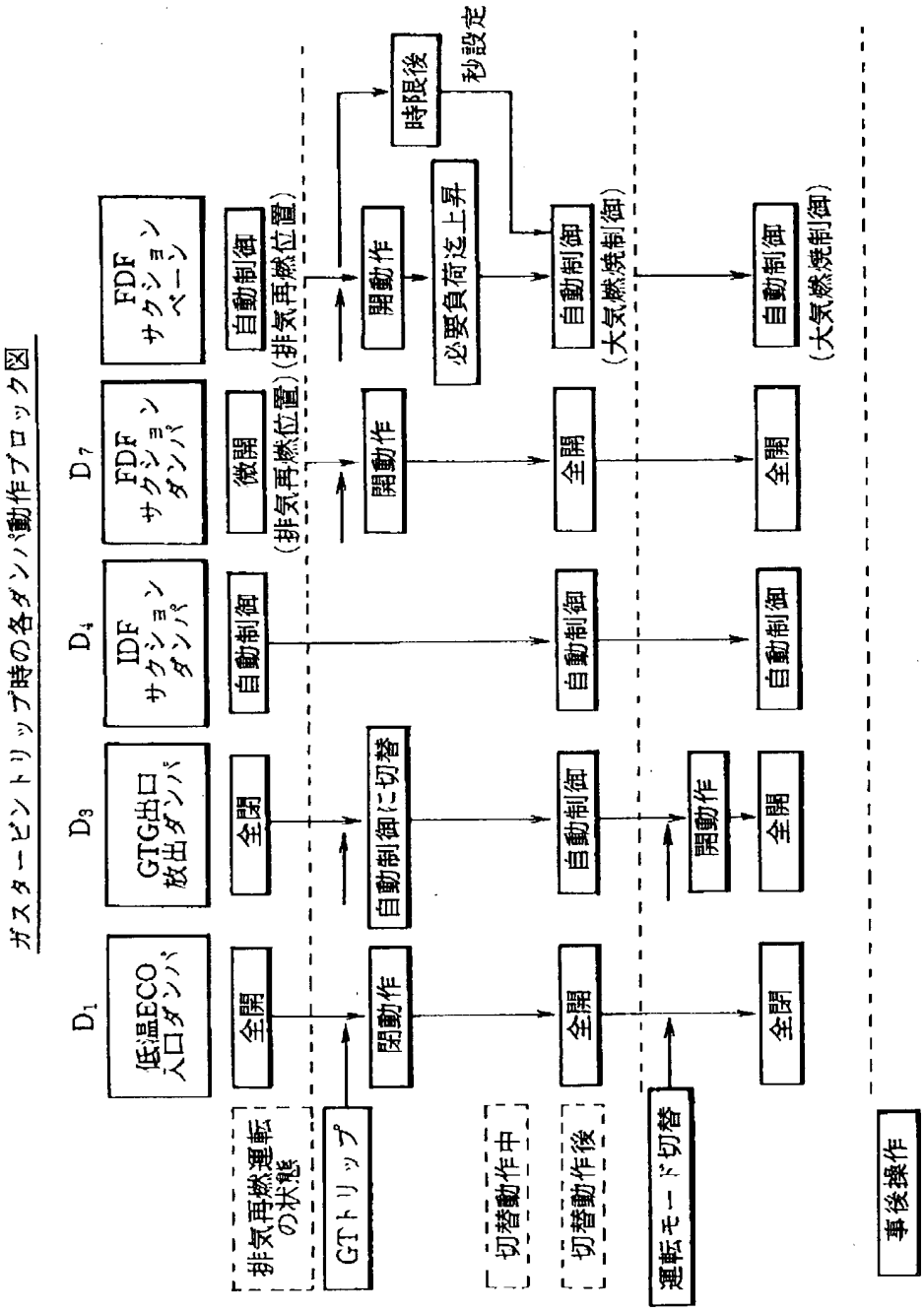
【図2】



【図3】



【図5】



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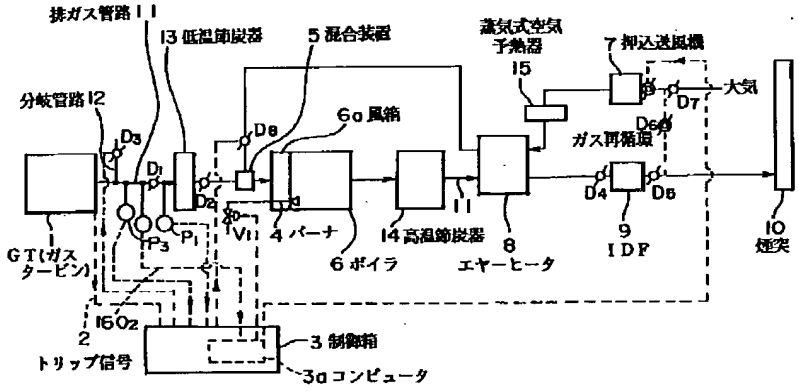
【補正対象項目名】図1
【補正方法】変更
【補正内容】
【図1】



フロントページの続き

(72)発明者　斉藤　仁一
神奈川県横浜市磯子区磯子１丁目２番10号　バブ日立エンジニアリングサービス株式会社内

(72)発明者　幸田　文夫
広島県呉市宝町６番９号　バブコツク日立株式会社呉工場内

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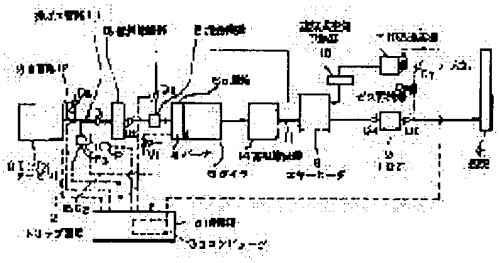
(71)Applicant : BABU HITACHI ENG SERVICE KK

(72)Inventor : KATO TAKAO
ARAI YASUICHI
SAITO JINICHI
KODA FUMIO

(54) AUTOMATIC RUNNING METHOD FOR FULL FIRED HEAT RECOVERY BOILER OF POWER GENERATING GAS TURBINE

(57)Abstract:

PURPOSE: To keep wind pressure in the damper upstream of an exhaust line nealy constant by making the exhaust gas line of a power generating gas turbine branch into a damper-attached branch path to connect a damper, a mixing device of air, anf the wind box of a boiler to an exhaust gas line for detecting wind pressure in the downstream of the damper of the exhaust gas line and controlling the damper of a branch pipe.



CONSTITUTION: A branch line 12 having an atmosphere blowoff exhaust gas quantity controlling means and a silencing means is connected to a power generating gas turbine exhaust gas line 11, and the mixing device 5 of air is provided on the inlet of the wind box 6a of a boiler 6 in the wake flow of the branch line 12. In the cutoff running for introducing exhaust gas, a damper D3 is controlled so that wind pressure P3 in the upstream of a damper D1 becomes always higher than wind pressure P1 in the downstream to prevent the occurrence of the backflow of combustion air form a boiler side, burner extinguishing, and back fire, etc., caused by P1>P3 due to abnormal high back pressure, performing safe running. In tripping the power generating gas turbine 1, a trip signal 2 is sent to a control box 3 to operate the damper D1 in a closed direction for preventing the reduction of the wind pressure P3.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the arrangement of equipment and the drawing of a tubing system which are used for operation of the invention in this application.
[Drawing 2] drawing 2 -- exhaust gas -- ** -- it is the perspective view of the equipment which mixes air.
[Drawing 3] Drawing 3 is type section drawing of other exhaust gas and the mixed equipment of air.
[Drawing 4] Drawing 4 is drawing of longitudinal section of a branched pipe 12.
[Drawing 5] Drawing 5 is the block diagram of each damper actuation at the time of GT trip.
1 GT (Gas Turbine for Generation of Electrical Energy)
2 Trip Signal
3 Control Box
3a Computer
4 Burner
5 Mixed Equipment
6 Boiler
6a Wind box
7 FDF (Pressure Fan)
8 Air Heater
9 IDF (Induced Draft Fan)
10 Chimney Stack
11 Exhaust Gas Pipe Way
12 Branched Pipe
13 Low-temperature Fuel Economizer
14 Elevated-Temperature Fuel Economizer
15 Steam Air Heater
16 O2 Signal
17 Damper
18 Stoma
19 Plate
19a Resistance orifice
20 Air Supply Tubing
21 Air Supply Branch Pipe
22 Damper

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] In the exhaust air recrudescence system which this invention connects the gas turbine exhaust gas pipe way for a generation of electrical energy to the boiler for a steamy generation of electrical energy, and it introduces exhaust air of a gas turbine, uses it for combustion of a boiler, and aims at power-up of a boiler Gas turbine exhaust air is introduced into a boiler. Or it is related with the unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy of making it recover a steam and need power for a short time without reducing a steam condition and the generation-of-electrical-energy force at the time of the unattended operation in the case of separating installation and carrying out each individual operation, and the trip of a gas turbine.
[0002]
[Description of the Prior Art] Although it is desirable that power backs up promptly by boiler turbine generation of electrical energy (it is called BTG for short) when the gas turbine for a generation of electrical energy (it calls for short Following GT) carries out a trip, instrumentation and a facility become complicated, also from the economical field, by the small power generating plant, a boiler is once stopped and the approach of turning a pressure fan (it being called FDF for short) after that, and rebooting is taken. Moreover, even when operating continuously, without suspending burner combustion of a boiler, after draft hunting by change generally decreases and boiler operation is stabilized, usually a fuel is increased, superheater outlet steam pressure (SOP), evaporation, and superheater outlet steam temperature (SOT) will descend under the effect by heat input reduction, the output of a steam turbine will also decline, and an adverse effect will be done to a process for about 10 minutes after GT trip.
[0003] When introducing GT exhaust gas into a boiler on the other hand, and also when separating the thing under installation to the reverse and making it bypass to atmospheric air, the actuation is what takes prudence extremely to GT and a boiler in order to make operation continue. Therefore, it is possible to how to take the timing of damper actuation, and a target wind pressure to become big troubles, such as fire extinguishing of the burner by the back run of the abnormal occurrence by the ** GT back pressure high, and boiler combustion air, and a backfire.
[0004]
[Problem(s) to be Solved by the Invention] when the pressure of GT exhaust gas outlet be control , operation of a boiler be stabilize in usual operation of GT and GT carry out a trip , a steam turbine generation of electrical energy recover to need level promptly , and it be to the approach of make backup promptly effective , and a list , for GT gas installation and actuation of a separation offer insurance and the unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy which be perform smoothly in the combination of the gas turbine for a generation of electrical energy , and the boiler for a generation of electrical energy .
[0005]
[Means for Solving the Problem] This invention is a gas turbine exhaust gas outlet for a generation of electrical energy, and a damper D3. The tee of a with branched pipe, A damper D1, exhaust gas, and the mixed equipment of air and the wind box of the boiler for a steamy generation of electrical energy are connected to a single string on an exhaust gas pipe way. Damper D1 Upstream wind pressure P3 Down-stream wind pressure P1 It detects and is said wind pressure P3. It is a damper D3 so that it may hold to a stationary mostly. It controls. It is the unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy characterized by making installation of the exhaust gas for using said boiler for a steamy generation of electrical energy as a backup boiler, and separation actuation perform safely easily.
[0006] Moreover, at the time of the trip of GT, it is a wind pressure P3 for a time. It holds to a steady-state value and, subsequently is a wind pressure P3. Wind pressure P1 To the value which a difference specifies, at the time of ******

Damper D1 It considers as a close by-pass bulb completely, and is D3. It is always P3. P1 It is the unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy which carries out control which prevents that gas flows backwards in size, and is characterized by emitting exhaust gas and backing up gas turbine power generation by the boiler for a steamy generation of electrical energy.
[0007]
[Example 1] Drawing 1 is the equipment and the drawing of a tubing system which are used for operation of the invention in this application. The branched pipe 12 which has the means of atmospheric-air bleedoff amount-of-exhaust-gas control and silence in the gas turbine outlet section of the gas turbine exhaust gas pipe way 11 for a generation of electrical energy is formed. Exhaust gas and the mixed equipment 5 of air are formed in the inlet port of wind box 6a of the boiler 6 for a steamy generation of electrical energy by the after that style. It sets to introductory separation operation of GT exhaust gas, and is a damper D1. Upstream wind pressure P3 It is always the down-stream wind pressure P1. It is a damper D3 so that it may hold highly. It controls. At the time of GT exhaust gas installation separation operation D1, D3 It is P1 at the abnormality in GT back pressure high by the actuation timing delay of a damper. P3 A safety operation is possible without the back run of the combustion air from the boiler side for becoming high, burner fire extinguishing, a backfire, etc.
[0008] At the time of the trip of the gas turbine 1 for a generation of electrical energy, the trip signal 2 is sent to the control box 3. It is D1 immediately after GT carries out a trip. It is usually full admission and is D3. It is a close by-pass bulb completely. By said trip signal, it is D1. Wind pressure P3 operate in the close direction promptly and according to rapid lowering of GT amount of exhaust gas Reduction is prevented. It is D3 fundamentally in the meantime. It is still a close by-pass bulb completely. if -- D3 if it is open promptly -- exhaust gas pressure P3 of the connection of the exhaust gas pipe way 11 of a branched pipe D1 Exhaust gas pressure P1 of back wash low -- ******** -- the branch pipe 12 from a boiler side -- Mukai -- once -- combustion air -- flowing backwards -- fear of fire extinguishing of a burner, and a backfire -- or the operation control of a boiler will be disturbed at least. (damper D1 It is necessary to take into consideration the pressure drawdown by the gas flow resistance of the section)
[0009] For this reason, it is D1 one by one. It is P1 while carrying out in the close direction. P3 to which only a certain value was set highly It is P3 from a set value so that a value may be maintained. It will be D3 if it becomes high. It becomes automatic open and prevents temporary GT back pressure high. However, it is P3 like the above. It is always P1. It controls highly and a back run is prevented. D1 After a close by-pass bulb completely is D3. Draft control is canceled, and moves to full admission, and reservation and reboot of an after [a trip] GT exhaust gas way are equipped with it.
[0010] Fluctuation of the boiler by GT trip can also be suppressed to min, without becoming an increase of a heat input, and an increase of air automatically corresponding to this, and on the other hand, making a boiler produce hunting operation, since the heat input reduction by exhaust gas and the lack of combustion air are produced by GT trip.
[0011] In addition, drawing 1 describes the device located in accordance with GT exhaust gas flow, and the device in alignment with air flow. The exhaust gas which came out of the gas turbine is a damper D1, the low-temperature fuel economizer 13, a damper D2, mixed equipment 5, wind box 6a, the furnace of a boiler 6, the elevated-temperature fuel economizer 14, an air heater 8, a damper D4, an induced draft fan 9, and a damper D5. It goes and is discharged from a chimney stack 10. About the combustion air of a boiler, they are a damper D7, a pressure fan 7, a steam air heater 15, an air heater 8, and a damper D8 from atmospheric air. It goes and is sent to mixed equipment 5. It is used for mixing with the exhaust gas from GT within mixed equipment 15, and this air being sent to wind box 6a, and burning the fuel from a burner 4. D6 It is the damper formed in the duct which recycles exhaust gas in a pressure fan, and is used for low NOx combustion.
[0012] If it is made such a configuration, while GT1 is carrying out load operation of a stationary, as for the exhaust gas of a gas turbine, using this for combustion effectively with the sensible heat of about 500 degrees C considerable at an elevated temperature and about 15.5% (vol%) of oxygen (O2) at an example is conventionally known as a repowering system of GT. On the other hand, the invention in this application makes possible unattended operation of GT atmospheric-air afterfire boiler which operates each damper that insurance and easy operation are possible and automatically [again], makes fluctuation of the boiler by GT trip min, and is changed to atmospheric-air combustion for a short time at the time of installation of GT gas, and separation like the above.
[0013] Drawing 5 is the block diagram of each damper at the time of GT trip of operation.
[0014]
[Example 2] Drawing 2 shows an example of the exhaust gas air-gas mixer used for operation of the invention in this application. It is the case where two or more stomata 18 are formed in the damper blade of the formed damper 17, in an

exhaust gas duct, an air duct, and a connection closely. A damper 17 has the usual damper ability and a close by-pass bulb completely can also supply the air of the minimal dose.
[0015] Thereby, injection mixing is possible for the time of GT exhaust gas recrudescence in a lot of exhaust gas in a small air content, GT exhaust gas is separated, and it is a damper D7 at the time of independent combustion of a boiler. It can be made open and a lot of air can be passed. A location is not taken with the damper of one sheet, either, but it can respond to exhaust air combustion and atmospheric-air combustion.
[0016]
[Example 3] Although efficient air exhaust gas mixing can be performed if cross one or more [of the air supply tubing 20 with two or more pinholes], an emission way is prepared, the air supply branch pipe 21 is further formed in the lower stream of a river and the damper 22 which controls the air content supplied from a branch pipe 21 is formed as shown in drawing 3 as an air-gas mixer, a duct becomes complicated and there is that of costs or a problem of cutting. Moreover, what prepared the mixed section which has arranged two or more wire gauzes to juxtaposition in the lower stream of a river of the location where exhaust gas flow and air flow cross may be used.
[0017]
[Example 4] Drawing 4 is drawing of longitudinal section of a branched pipe 12. Damper D3 formed here In order to pass exhaust gas to a whole-quantity boiler in operation of a stationary, it is a close by-pass bulb completely. However, when introducing exhaust gas into a boiler, it separates conversely, and sometimes, it is a pressure P3. Stationary P1 It is controlled by the signal from the control box 3 to make it a high value. At the time of GT trip, a pressure P3 is uniformly held for a time by the signal from the carrier beam control box 3 in the trip signal 2. At this time, it is D3. Although it is close, it is the damper D1 by the side of a boiler. It is D3 so that the wind pressure of GT exhaust gas may not serve as the abnormality high since it becomes close quickly, and there may be no inflow of the back run gas from the boiler side which checks boiler operation. A damper is controlled. Subsequently, damper D1 Draft control is canceled at a close by-pass bulb completely and this event, and a damper D3 goes as open one by one automatically.
[0018] This damper D3 When carrying out the parallel arrangement or more of one, this section functions as a silencer the plate 19 which has one or more resistance orifice 19a in a branch pipe by back wash. Damper D3 It also becomes the resistance for [since the plate 19 with a resistance orifice is in back wash] exhaust gas bleedoff, and is a damper D3 now. A controllability is raised. Moreover, a silencer can be made unnecessary by the silence function. Damper D3 Actuation is a damper D1. It corresponds with actuation and is a damper D1. Since back wash has a boiler facility, there will be resistance. On the other hand, it is a damper D3. A controllability flows [since there is usually no orifice in back wash, there is no resistance and / a lot of / few openings / gas] that is, is bad. The invention in this application makes this a solution plug.
[0019]
[Example 5] It is O2 which wind box 6a needs by computer 3a which the control box 3 receives the output signal of a gas turbine, the signal of atmospheric temperature, the signal of a boiler load, and O2 signal of exhaust gas, among those harbors them. An amount can be calculated, the blade opening of a pressure fan 7 can be controlled, and, thereby, a suitable air content can be sent into a wind box.
[0020] Usually, O2 in wind box 6a Now, texture ****** is an air content that it should measure and this should be made constant value O2 in a wind box The response to buildup of the air content when becoming load size of the delay of "dispersion" measurement and a boiler cannot be performed.
[0021]
[Example 6] On the occasion of operation of the exhaust air recrudescence boiler concerning the invention in this application, the change to the exhaust air combustion from atmospheric-air combustion, and in the case of the reverse, it sets, and is a damper D1. It considers as **** and **** by manual operation, and is the atmospheric-air bleedoff damper D3. Lower wind pressure P1 P3 [high] It controls automatically by carrying out and stable operation is carried out.
[0022]
[Example 7] In addition, D7 which controls the amount of inhalation atmospheric air into the atmospheric-air inlet-side duct of FDF (pressure fan)7 It is prepared. If GT trip is carried out at the time of exhaust air recrudescence, an air content is made to increase promptly and it must consider as atmospheric-air combustion. At this time, it is D7. By opening fully for a short time, it can respond together with open actuation of a suction blade separately. These D7 Control as prepared automatic-control blades, such as a suction **-N mold, between a damper and a connection with FDF of a duct and shown in the block diagram of drawing 5 can be performed.
[0023]

[Example 8] The following of having observed the imitation at the time of the trip of the gas turbine for a generation of electrical energy per boiler is carried out. The trip of the gas turbine was carried out in the state of 1000kW of gas turbine loads, and a 30t [/h] boiler load, and it checked that a boiler could operate safely.
** atmospheric-air combustion sky gaseous state voice which inputted combustion air to the control unit beforehand from the afterfire condition -- loading lifting -- carrying out -- for about 45 seconds -- the -- condition maintenance was carried out and after that usual automatic-control operation was started.
** It is ****** to unattended operation usual after corresponding to it after the amount of supply of air increasing, and the amount of supply to the burner of a fuel increasing and holding the condition for about 45 seconds.
** The condition of combustion being especially stable and becoming a problem is inside ****.
** The fuel economizer inlet-port damper D1 and atmospheric-air bleedoff damper D3 It is inside **** that operate as the plan was made, respectively, and a gas turbine outlet pressure goes up beyond the need.
** It has checked that the main steam pressure of a boiler, main steam temperature, and evaporation hardly changed.
[0024]
[Effect of the Invention] The following effectiveness is acquired by carrying out this invention.
(1) the time of installation of GT exhaust gas, and separation operation -- wind pressure P3 always -- P1 since it is held highly, without there is no back run of the combustion air of a boiler and ** TGT ******** becomes high unusually -- insurance -- and exhaust gas installation or separation actuation can be performed easily.
(2) Carry out the following per return of the boiler item at the time of GT trip. After carrying out GT TORIPU for example in the combination of rated boiler evaporation 42 T/H, SOT(superheater outlet temperature) 470degree C, SOP(superheater outlet pressure)83atg, the boiler for a steam turbine generation of electrical energy, and GT, since a **** thing can increase [the bottom] supply fuel quantity promptly after a trip by the invention in this application, with ** conventional method, lowering of evaporation is not accepted in 33T/H after 5 minutes.
** SOT changes in a conventional method, as for SOT, a ****** thing changes to 455 degrees C by this application approach, and it is inside ****.
** Although SOP is set to 79atg(s) in a conventional method, the failure of pressure is accepted in the invention in this application, and it is inside ****.
(3) Since the effect on the boiler by GT trip was promptly backed up by this application approach, the adverse effect to a plant was removed thoroughly.
[0025]

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The gas turbine exhaust gas outlet for a generation of electrical energy, and damper D3 The tee of a with branched pipe, A damper D1, exhaust gas, and the mixed equipment of air and the wind box of the boiler for a steamy generation of electrical energy are connected on an exhaust gas pipe way. Damper D1 Upstream wind pressure P3 Down-stream wind pressure P1 It detects and is said wind pressure P3. It is a damper D3 so that it may hold to a stationary mostly. It controls. Installation of the exhaust gas for using said boiler for a steamy generation of electrical energy as a backup boiler, the unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy characterized by carrying out easy safe separation actuation.
[Claim 2] At the time of the trip of the gas turbine for a generation of electrical energy, it is a wind pressure P3 for a time. It holds to a steady-state value and, subsequently is a wind pressure P3. Wind pressure P1 To the value which a difference specifies, at the time of ****** Damper D1 It considers as a close by-pass bulb completely, and is a damper D3. It is always P3. P1 Carry out open control which does not carry out a gas back run in size, and exhaust gas is emitted. The unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy of claim 1 characterized by backing up gas turbine power generation instancy and quickly by the boiler for a steamy generation of electrical energy.
[Claim 3] Damper D3 An orifice is prepared in the branched pipe of a with at the atmospheric-air bleedoff side of this damper, and it is a damper D3 to the silence at the time of exhaust gas bleedoff, and coincidence. The unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy according to claim 1 or 2 characterized by raising a controllability.
[Claim 4] The unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy according to claim 1 or 2 characterized by having prepared two or more stomata for air passage in the damper blade of the damper formed in the air pipe way which connects mixing of air with exhaust gas on an exhaust gas pipe way, and raising a mixed function to it.
[Claim 5] O2 which inputs the signal of a gas turbine output, exhaust gas temperature, atmospheric temperature, and a boiler load to a microcomputer, and is needed with a boiler wind box The unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy according to claim 1 to 4 characterized by calculating an amount, determining supply air volume, directing the blade opening of a pressure fan, and carrying out air-capacity accommodation.
[Claim 6] Said damper D1 **** and **** actuation are carried out manually and it is the damper D3 for atmospheric-air bleedoff. Down-stream wind pressure P1 High value P3 The unattended operation approach of the gas turbine exhaust air recrudescence boiler for a generation of electrical energy according to claim 1 to 5 characterized by controlling automatically.

[Translation done.]